

RELAMPAGO Science Steering Group



Co-Chairs: Steve Nesbitt, U. Illinois (US NSF PI) and Paola Salio, U. of Buenos Aires, CIMA (Argentina PI)

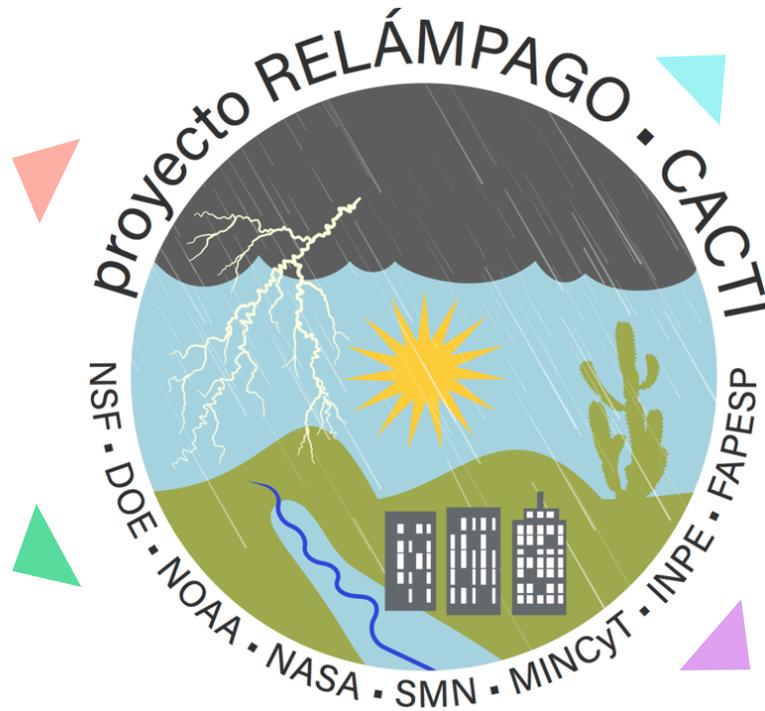
- **Synoptic to mesoscale processes** (Lead: Steve Nesbitt, Eleonora Demaria, Francina Dominguez, David Gochis, Robert Houze, Lynn McMurdie, Matilde Nicolini, Kristen Rasmussen, Paola Salio, Luciano Vidal, Tammy Weckwerth, Jim Wilson, Edward Zipser, Manuel Zuluaga)
- **Convective to microphysical processes** (Lead: Lawrence Carey, Tim Lang, Adam Varble, Rachel Albrecht, Carlos Morales, Steve Goodman, Graciela Lucia Binimelis de Raga, Matthew Kumjian, Gabriela Nicora, Daniel Cecil, R. Jeffrey Trapp, Eldo Avila, Rodrigo Bürgesser, Chandra, Greg Thompson, Scott Ellis, Wiebke Deierling)
- **Processes to prediction of high impact weather** (Lead: Rita Roberts, Celeste Saulo, Juan Ruiz, Yanina Garcia Skabar, Ernani Nascimento, Daniel Vila, Luiz Machado, Matilde Nicolini, Eve Gruntfest, Rebecca Morss, Valeria Hernandez, Joshua Wurman, Karen Kosiba, James Marquis)

USA Universities

UIUC
UT
CSU
CU
UW
PSU

USA Institutions

DOE – (BNL, PNNL, LBNL)
NCAR
CSWR
NOAA
NASA



Argentine Universities

Buenos Aires
Córdoba
Cuyo

Argentine Institutions

SMN
DACC
MinCyT
INVAP

Brazil Universities/Institutions

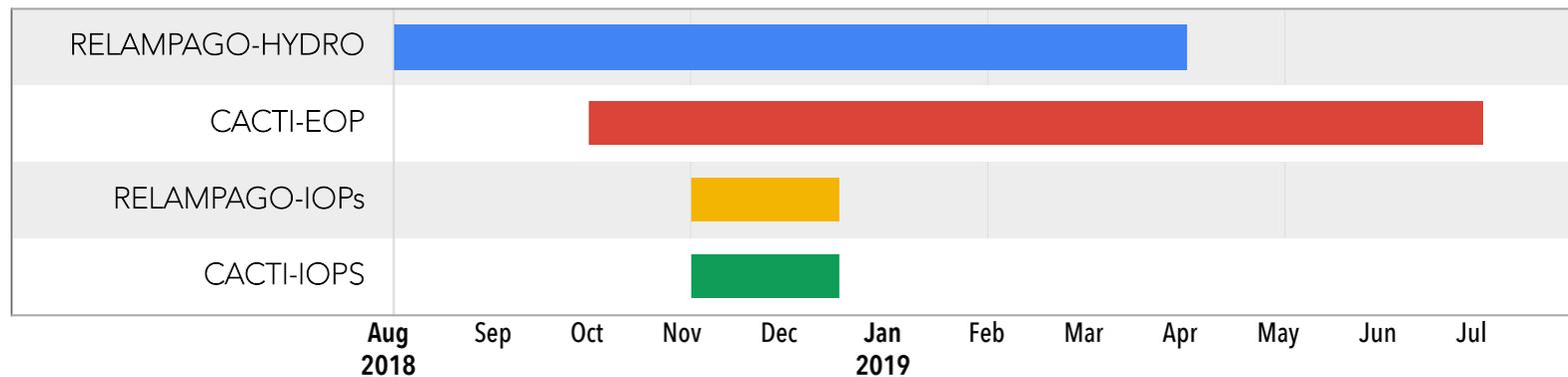
University of Santa María
University of São Paulo
INPE
FAPESP

RELAMPAGO – CACTI Contributions



NSF – RELAMPAGO (USA) S-PolKa 3 DOWs 1200 Soundings + 5 sounding vehicles 3 Mesonet vehicles 20 Pods WV-DIAL LIDAR 15 ISFS/ meteorological stations/disdrometers	DOE – CACTI (USA) AMF-1 (cloud/profiling suite, aerosol measurements) C-SAPR2 G-1 (microphysical and aerosol aircraft)	SMN (Argentina) C-Band DualPol operational network radars Mobile soundings Enhancement of operational radiosondes Distrometers	INPE/FAPESP (Brazil) X- and S- Band DualPol downstream radars Precip/profiling supersite Lightning mapping array Sticknet
		NASA (USA) Disdrometers Rain gauges	NOAA (USA) Lightning mapping array Field mills

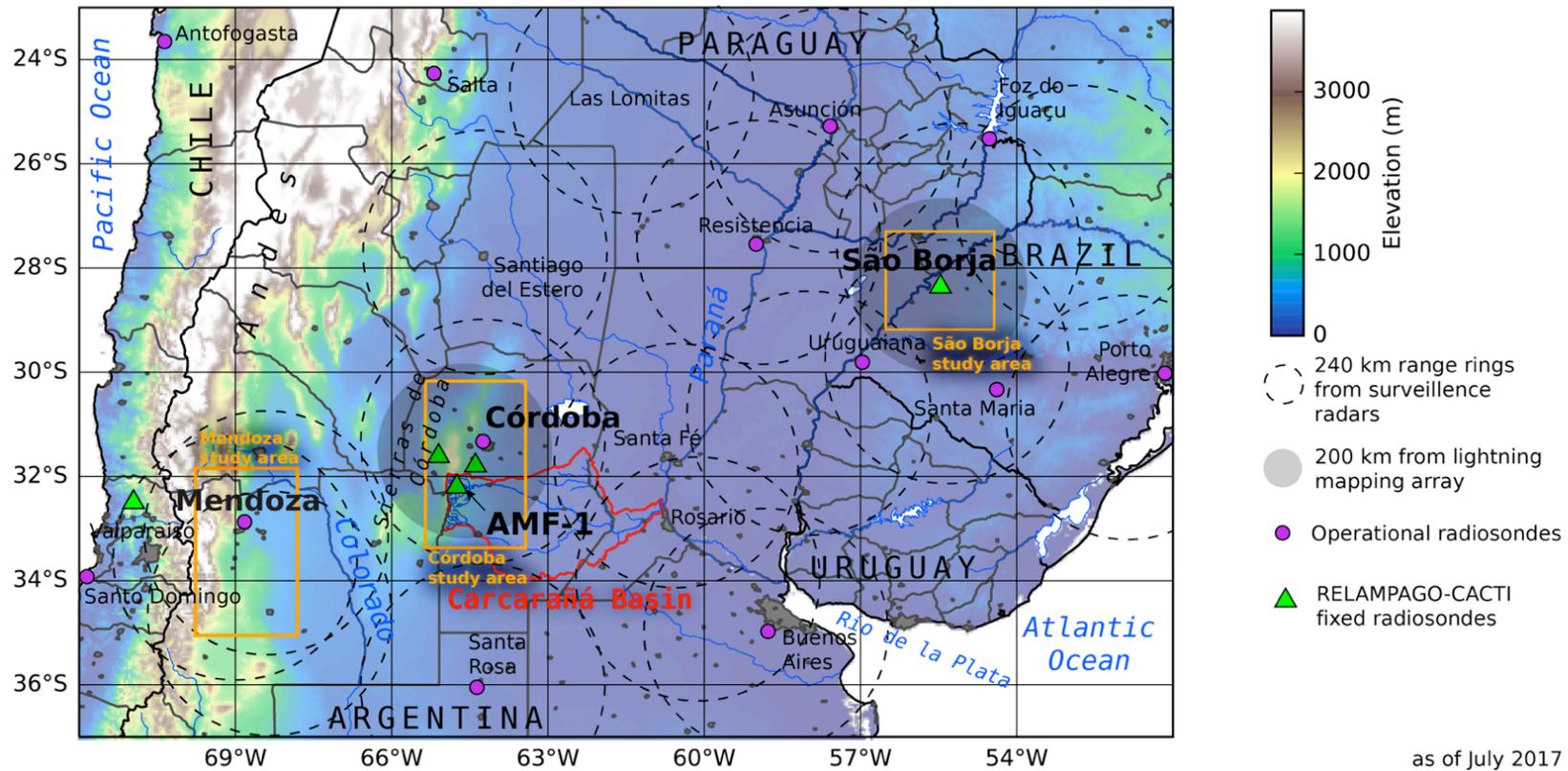
RELAMPAGO – Timeline



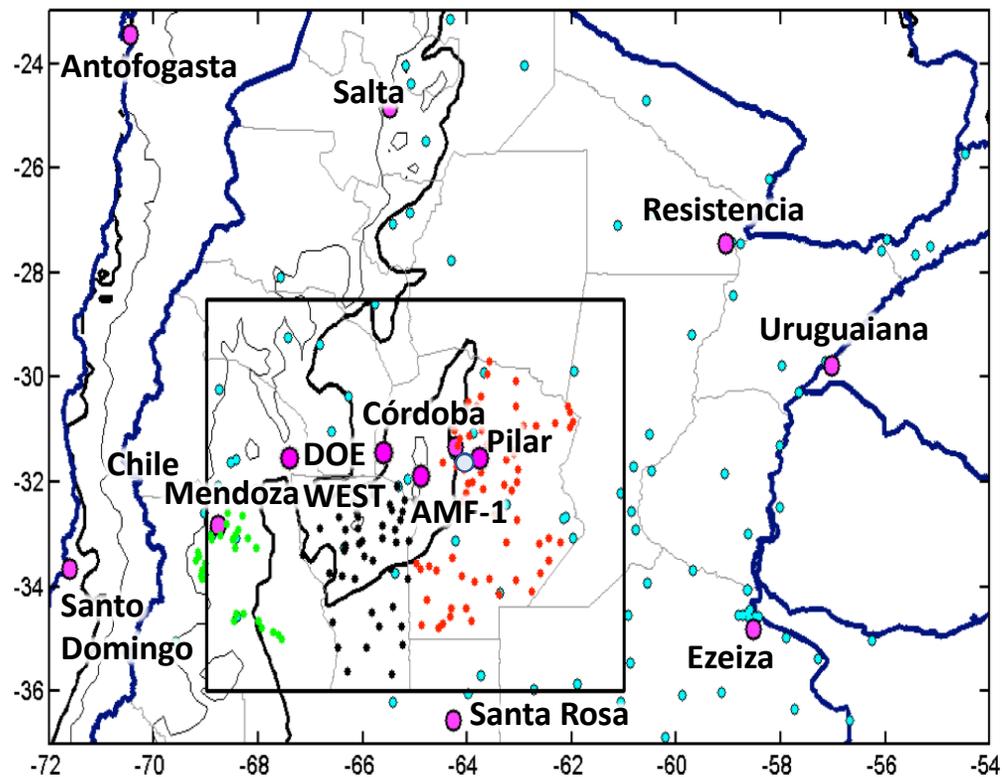
- 1) Pre-field campaign project design, research, integration
 - RELAMPAGO Dry Run 1 (Nov 2017)
 - RELAMPAGO Dry Run 2 (planned, June 2018)
- 2) Societal and governmental engagement (2015 –)
- 3) Large multi-agency field campaign + forecasting and nowcasting activities (2018-2019)
- 4) Post-project science (2018 –)



Broad Study domain



Surface and Upper-air Network

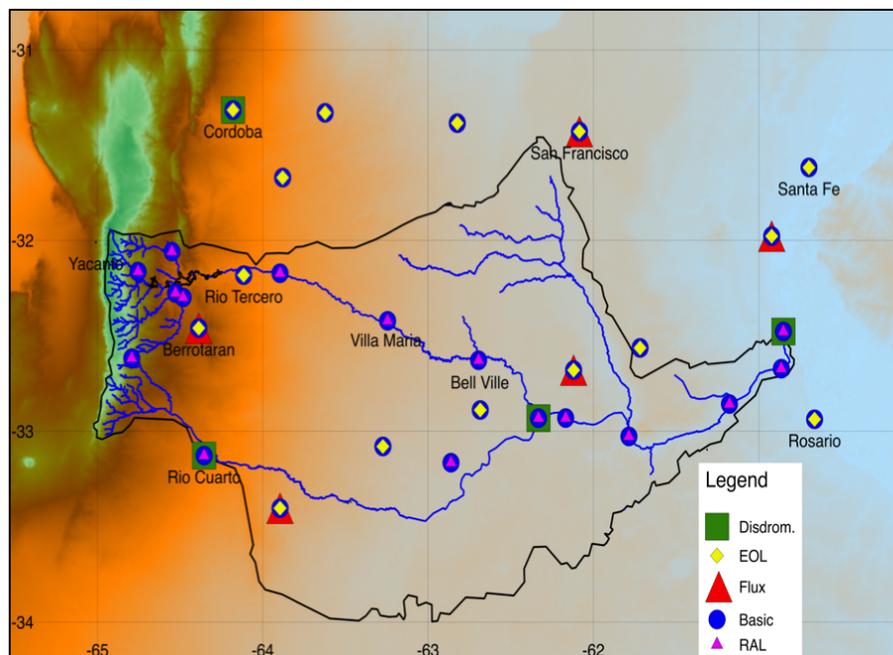


- RAOBs
- PODS + Mesonet
- Surface stations**
 - SMN surface stations
 - Board of Cereals, Córdoba
 - Universidad de La Punta
 - DACC, Mendoza



Hydrometeorology Network

GOAL: Analyze the role of the earth's surface in modulating the observed variability of heavy rainfall and flooding in the Carcaraña River Basin



Rain gauges

~20 Parsivel Disdrometers
(NCAR/NASA/CSWR/SMN)

ARM 2DVD

6 Surface flux towers

~20 Weather stations

Streamflow observations

Mobile Acoustic Doppler Current Profiler

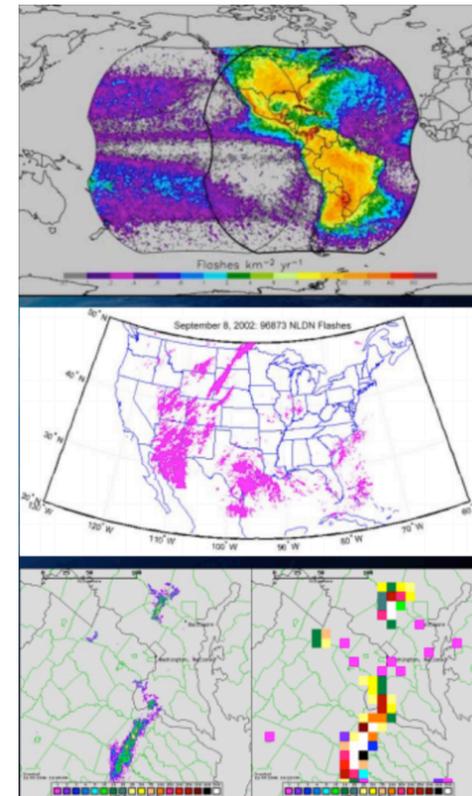
Streamflow cameras

Groundwater observations

Lightning



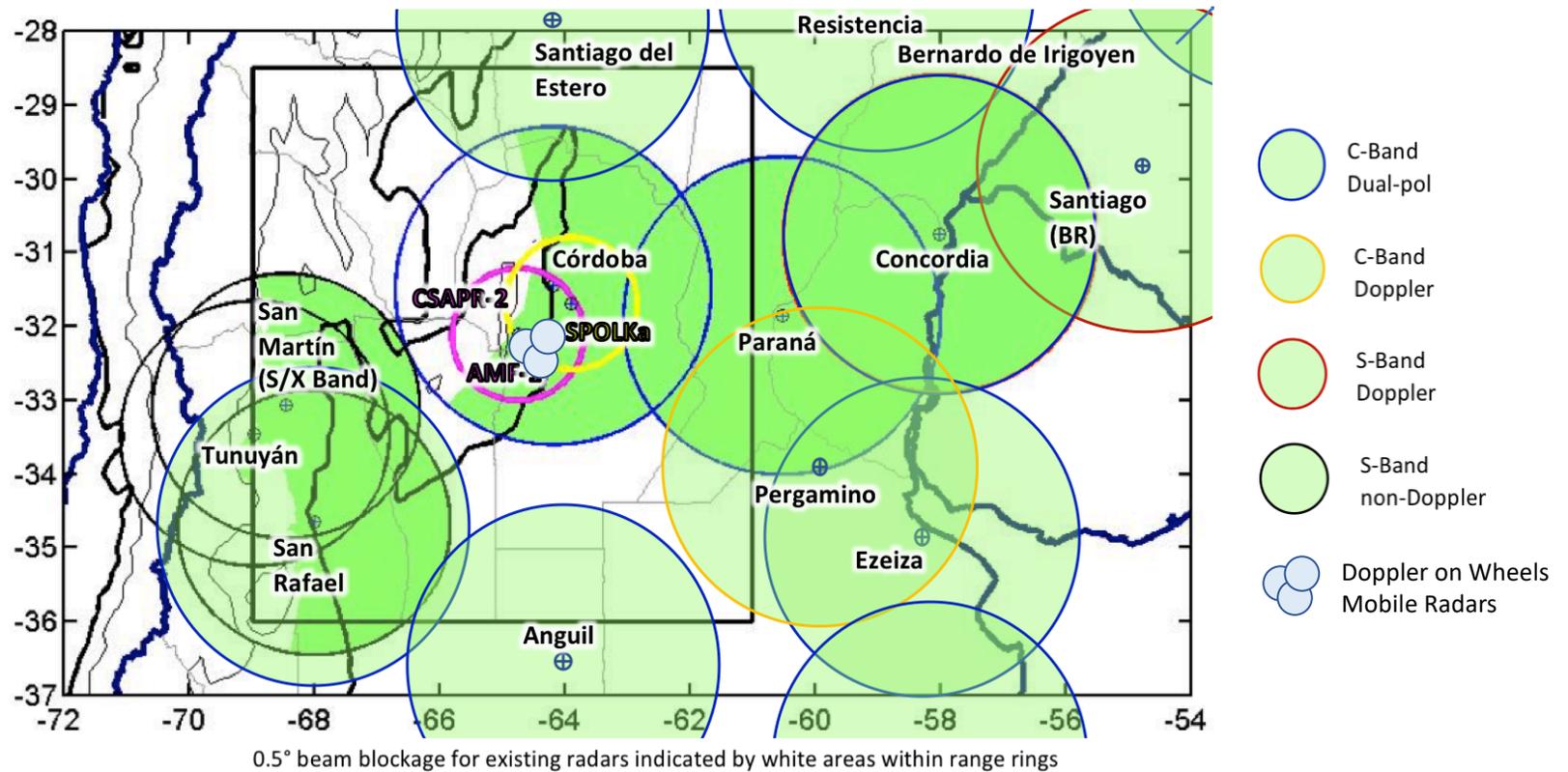
- GOES-R GLM validation and science (GOES-R becomes GOES-E)
- Demonstrate use of real time lightning information for nowcasting
- Documents thunderstorm environments, allowing investigation of link between pre-storm environment and subsequent electrification (e.g., anomalous/inverted charge structures common in dry, high-cloud-base environments)
- Provides validation dataset for thunderstorm electrification models



Courtesy S. Goodman



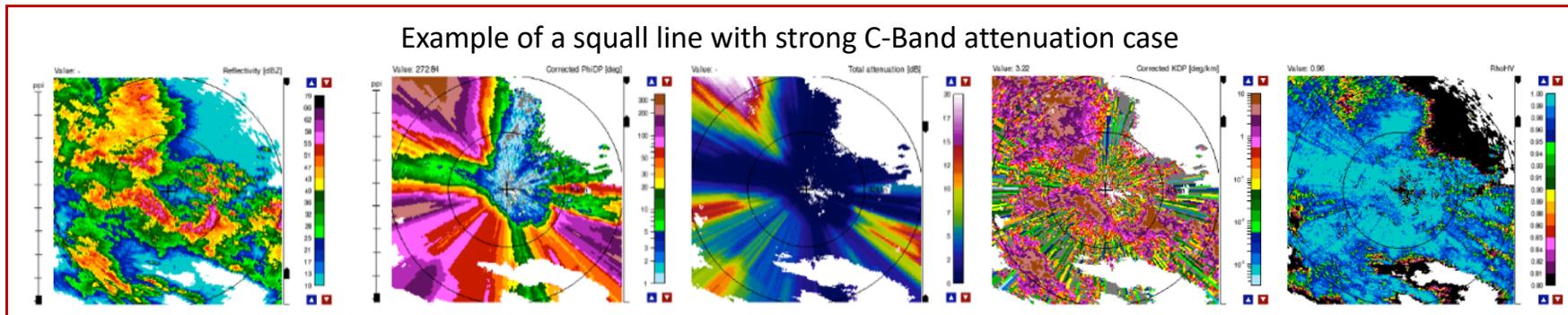
Operational Radar Network



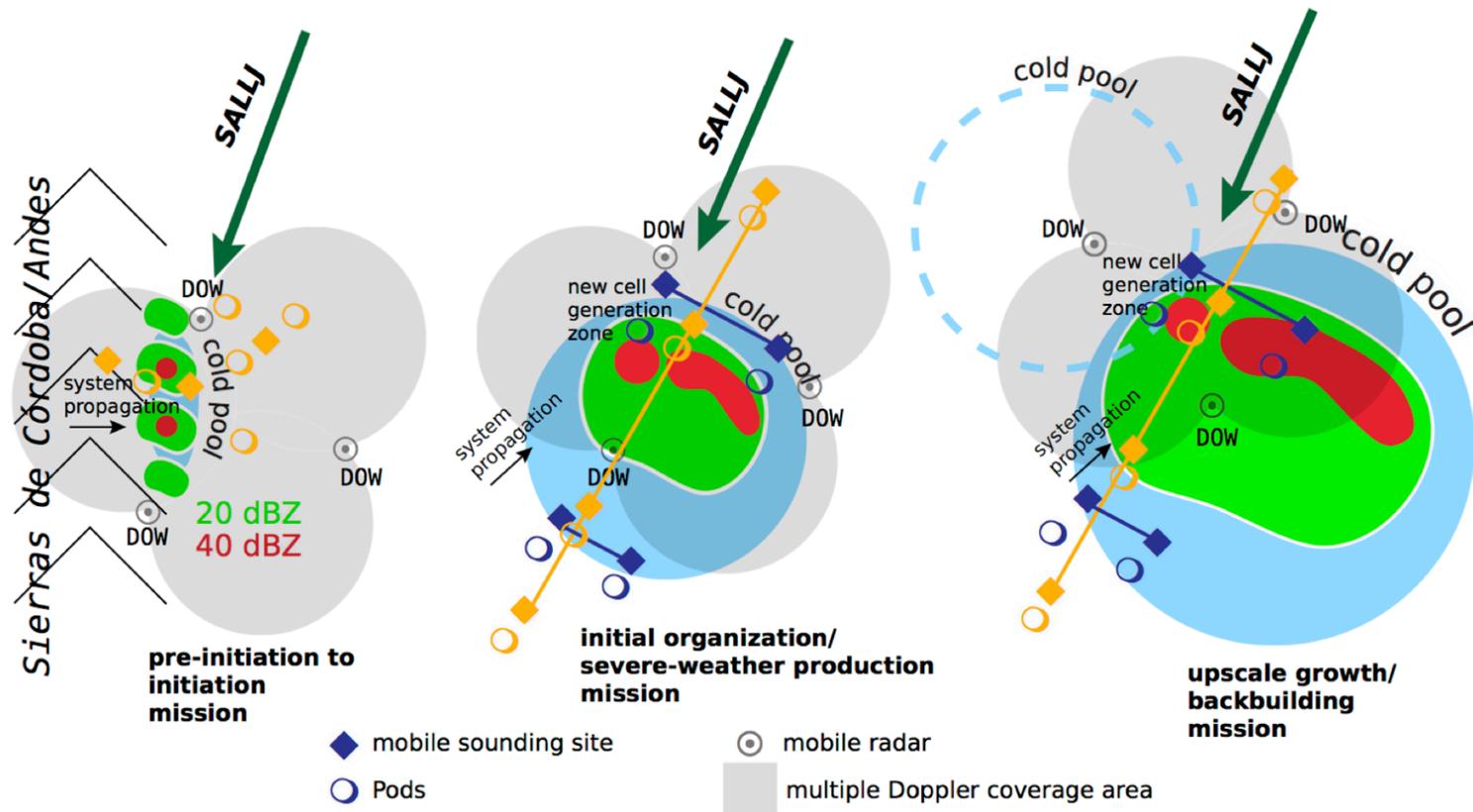
S-PolKa and DOW operations

- DOWS will provide dual polarization data, but be operated primarily in dual-Doppler scanning modes (volume scanning, 5 minute refresh)
- C-band Argentinian radars (and C-SAPR2) will suffer from attenuation and backscatter differential phase effects, amount of real-time scan control?
- S-PolKa can help with calibration and algorithm development for C-Band radars, **critical in hail, large drops, and heavy precipitation**
- Provide RHIs, QPE, microphysics and cloud liquid water/water vapor retrievals

Example of a squall line with strong C-Band attenuation case

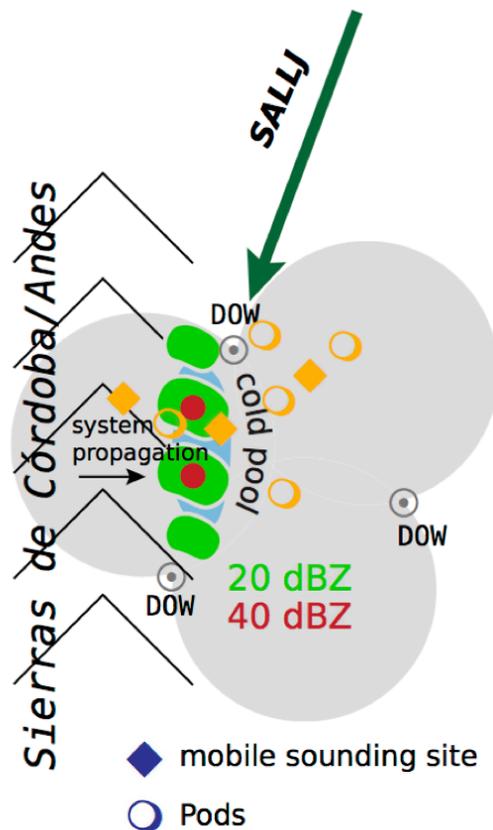


Mobile Sampling Strategies



Mobile Sampling Strategies

Pre-Initiation to Initiation Mission



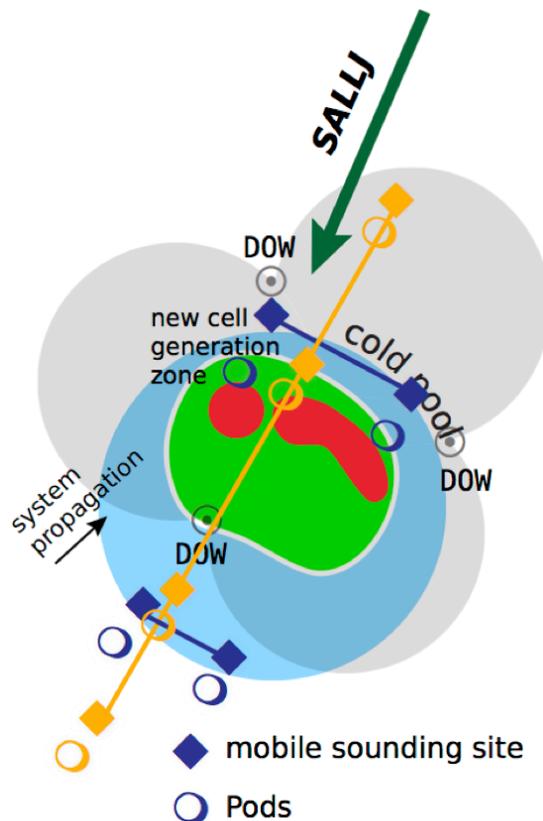
The goal is to sample the full tropospheric structure of the mesoscale environment, prior to and in the region of anticipated convection initiation (CI)

In the Córdoba study area, the local terrain is a key for CI and thus the terrain will be the primary focus for the CI missions

Opportunity for collaboration with CACTI – AMF site

Mobile Sampling Strategies

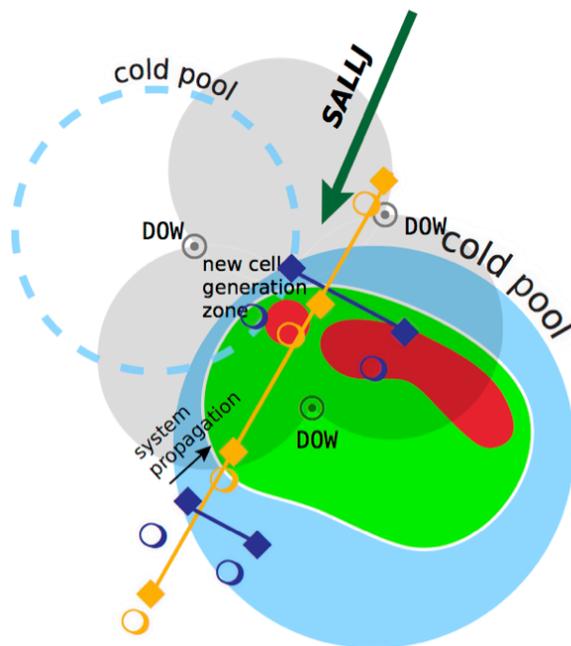
Severe-Weather Mission



Mobile deployments during these missions will be similar to those for CI missions (larger spacing). The focus of the observations will be on the zones of new cell generation upshear of organized convection, where the cold pool is interacting with the LLJ, and possibly remnant or developing proximate cold pools or other boundaries in this location

Mobile Sampling Strategies

Upscale Growth Mission



◆ mobile sounding site

○ Pods

⊙ mobile radar

■ multiple Doppler coverage area

Sample the convective structure and its associated mesoscale environment with **two basic strategies**

Line-normal strategy: array of mobile units deployed normal to and across the active convective line segment

Line-parallel strategy: Two mobile units deployed ahead of and parallel to the convective line and two mobile units deployed behind the convective line



GOES-16 imagery

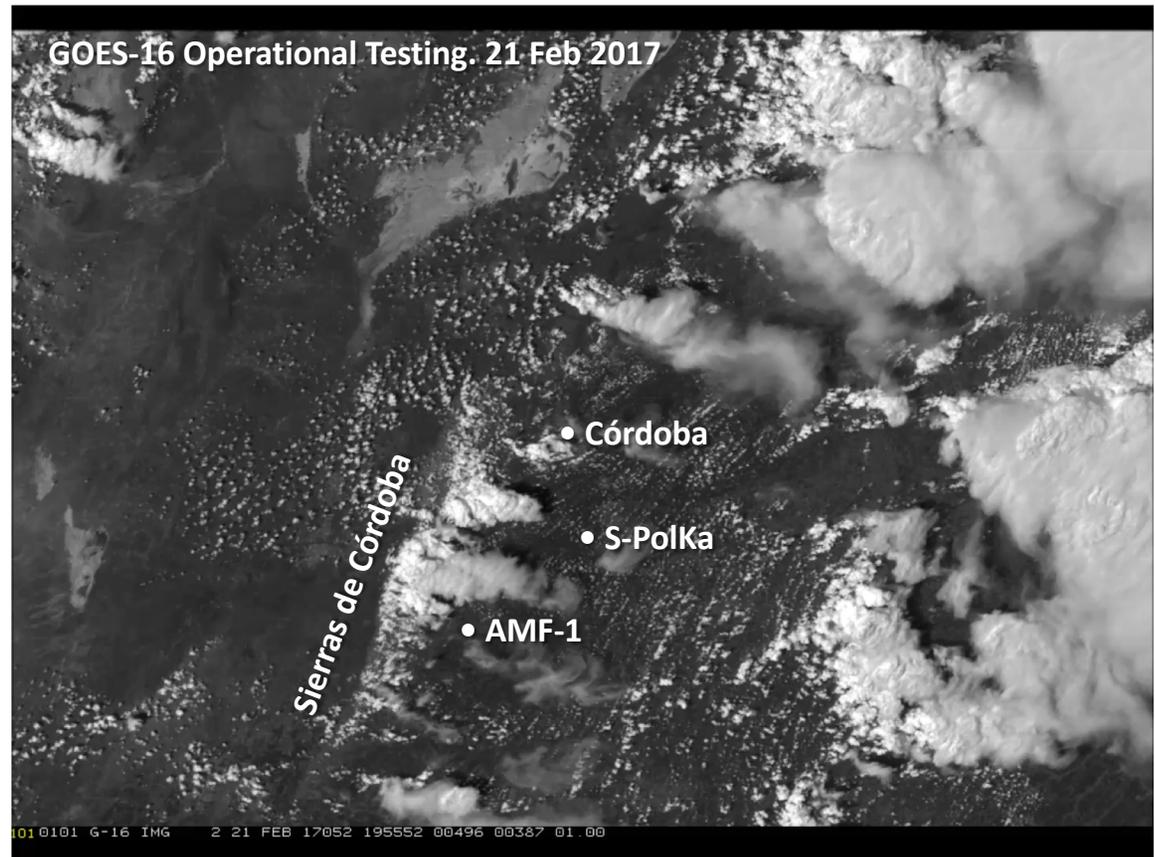
RELAMPAGO
NASA/NOAA

GOES-16, GOES-17 validation
GPM validation

Mesoscale scanning from GOES-17 in
test mode + GOES-16

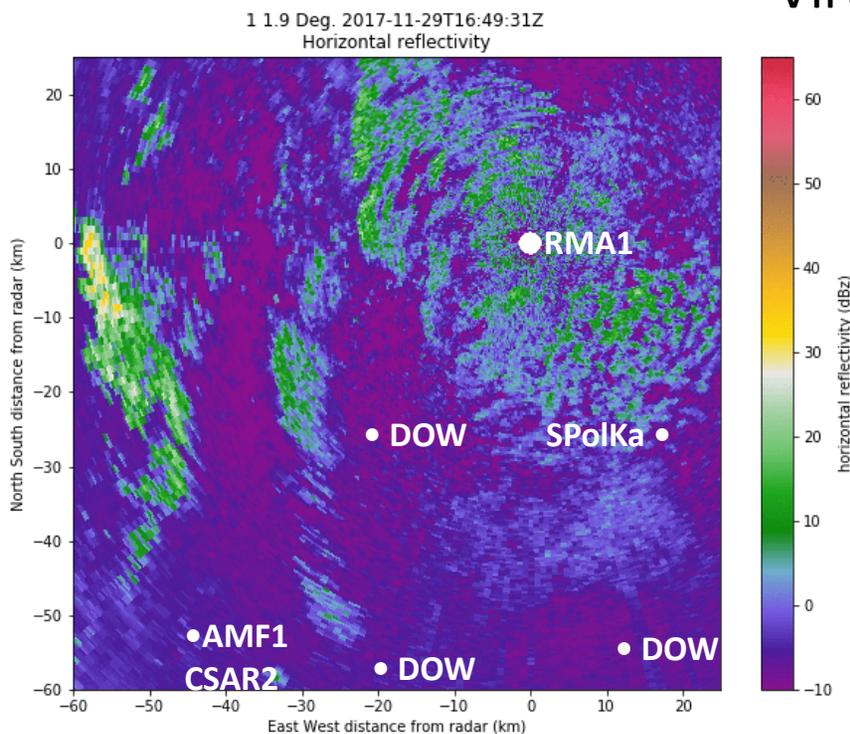
Validation:

GLM flash products
ABI Cloud and precipitation retrievals
ABI Aerosol products
GPM DPR/GMI/IMERG rainfall products



RELAMPAGO dry run

Virtual campaign over 8 days in Nov 2017



- Comprehensive data collection (operational data, global and mesoscale NWP)
- Forecast operation including SMN, INPE-CPTEC, University forecasters (AR+US)
- Virtual placement of mobile assets (radars, soundings, mobile mesonets) and hydrology
- Post dry run evaluation of procedures for RELAMPAGO dry run

Modeling Strategy



Global

- GFS, GEFS, ECMWF, GEOS-5 Evaluation

Real-time high-resolution deterministic NWP

- Operational: SMN-WRF, BRAMS
- Research: CSU 4-km, UIUC 3-km WRF+WRF-Hydro (offline), UIUC 3-km MPAS, Meso-NH 1-km

Real-time experimental ensemble forecasting

- 60 member LETKF 4-km WRF ensemble, assimilating operational Doppler velocities
 - Collaboration SMN, UBA, and UIUC (run on NCAR Cheyenne)

Post-project

- DOE-ASR, NSF PIs; Join the modeling team!

Public Engagement & Outreach



<http://relampago-cacti.org>

RELAMPAGO - CACTI

A project to study the initiation, prediction, and societal impacts of convective systems in Southeast South America

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proyecto RELÁMPAGO
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campaign to study high impact weather
in central Argentina in 2018
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Argentina
Joined February 2017

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#ARMAGU with @70_dbz @DrAngelaRowe @tJiang @PSU_RadarMeteo and
@adam_varble

RELAMPAGO Open House: 31 October 2018 – Córdoba